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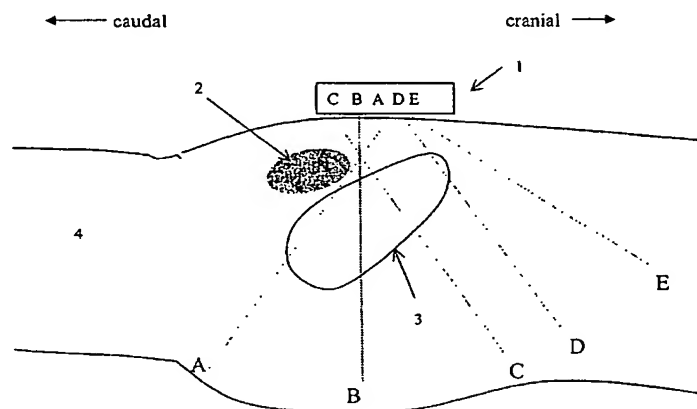
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **INSTANTANEOUS ULTRASONIC MEASUREMENT OF BLADDER VOLUME**



(57) Abstract: An apparatus and methods to quantify the volume of urine in a human bladder with a limited number of acoustic beams is disclosed. In a first version the apparatus is composed of a transducers assembly that transmits a plurality of narrow ultrasound beams in different directions towards the bladder and receives the returning ultrasound signals; a receiver detector for processing the returned signals; an analog-to-digital converter; a memory to store the digitized data and a volume display allowing to define the optimal position of the transducer assembly. The apparatus also includes a signal processing software that automatically determines the bladder Depth D and Height H and computes the volume of urine using an empirical formula corrected by specific, empirically measured, filling dependant correction factors. In a second version a single wide angle ultrasound beam transducer transmitting ultrasound signals at fundamental frequency is used to quantify the urine volume. Return signals originating from a depth beyond the usual position of the posterior wall depth of a filled bladder are analyzed for presence of higher harmonic signals which in turn are related to presence or absence of urine. Both methods or a combination thereof can be used as a simple warning device for presence of residual urine after voiding or indicate the presence of a critical bladder urine filling level.

# INTERNATIONAL SEARCH REPORT

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## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B8/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 213 949 B1 (GANGULY ET AL.) 10 April 2001 (2001-04-10)	1-5, 7, 8, 10, 18, 20-22, 24-26, 47
Y	the whole document	16, 28 14, 27, 30
A	---	
Y	US 5 058 591 A (COMPANION ET AL.) 22 October 1991 (1991-10-22) column 9, line 8 - line 36; figures 1-6	16
Y	---	
Y	US 6 406 431 B1 (BARNARD ET AL.) 18 June 2002 (2002-06-18) abstract; figures 1-4	28
A	---	
	US 5 964 710 A (GANGULY ET AL.) 12 October 1999 (1999-10-12) the whole document	1, 20, 24, 44, 45, 47
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 110 111 A (BARNARD) 29 August 2000 (2000-08-29) the whole document -----	1,20,24, 44,45,47
A	US 5 235 985 A (MCMORROW ET AL.) 17 August 1993 (1993-08-17) the whole document -----	1,20,24, 44,45,47

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6213949	B1	10-04-2001	US 6565512 B1	20-05-2003
US 5058591	A	22-10-1991	US 4852578 A	01-08-1989
			BR 8707878 A	03-10-1989
			WO 8803390 A1	19-05-1988
US 6406431	B1	18-06-2002	NONE	
US 5964710	A	12-10-1999	US 6565512 B1	20-05-2003
US 6110111	A	29-08-2000	EP 1180973 A1	27-02-2002
			JP 2003500095 T	07-01-2003
			WO 0071030 A1	30-11-2000
US 5235985	A	17-08-1993	CA 2134472 A1	11-11-1993
			JP 8500023 T	09-01-1996
			WO 9321827 A1	11-11-1993